I close with a single reflection on the outlook of biological generalization of the day. At no time during the last twenty-five years have evolution hypotheses been so up in the air as just now. A few writers believe that the idea of evolution itself is going to smash. Sober, well-balanced naturalists are not skeptical to this extent. Many of them are, however, disposed to settle down to the view that search after a *method* by which species originate is time wasted simply because there is no such a thing. There are many factors, they say, in evolution, and biology has done all incumbent upon it when it has found out what they are. Certain it is now that there are various factors in species production, and it is a great achievement to have unearthed so many of them. Natural selection is a widely operative factor; so is sexual selection; so is orthogenesis; so is isolation; so, quite certainly, is mutation. The list, were it complete, of more or less distinct, more or less efficient, factors would be much longer. I ask are we to rest here? Having corralled these *factors*, are we going to write *finis* over the gate of the corral? Not if biological motive is true to itself. Does not your mind and mine, and every mind that is in the habit of thinking at all, start off immediately and unrestrainably, the last factor having been lodged in the corral, in quest of some one or at least a less number of factors or principles underlying those already captured? If species are fully produced by so many different causes, different combinations of these operating together in different groups of plants and animals, how do we know that species have anything in common? Is it a tenet of biology or any other physical or spiritual science that unlike causes produce like results? And if you are not certain that all species have something in common, what justification have you in attempting to treat them all alike in classification? What is the good of bothering about uniform rules of nomenclature if the rules are to apply to different things? But are we not warranted in believing, nay, are we not compelled by the totality of biological data to believe that there is more unity in evolution than all these factors indicate? Is there not fundamentality in the metabolic processes of organisms? Is not this true also of response to stimulus? Is it not true of reproduction? Has not the cellular theory of organization a unifying principle in it that is about the securest of all biological generalizations?

It is, I am confident, only stating what every thoughtful naturalist assents to without hesitation to say that the goal of biology—not a remote, but the immediate, animating goal—is greater unification of its knowledge. Minds can never rest from the search for deeper, more inclusive principles. This brings our evening's discussion to a close at the point from which it started.

University of California, Berkeley, California.

THE BIRD ISLANDS OF SOUTH AFRICA [1]

By W. L. SCLATER M. B. O. U.

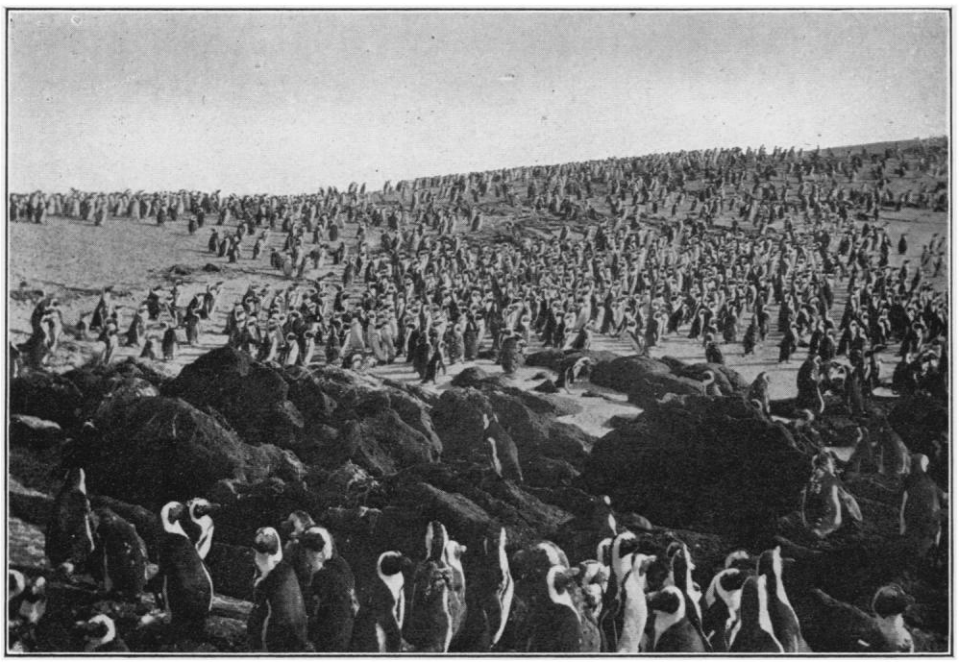
ONE of the most remarkable forms of bird life at present existing is certainly the group of Penguins. These birds, which constitute the Order Impennes, stand wide apart from all the other living Orders of birds not only in their structure but also in their life history and distribution. They are the only birds in which the metatarsal bones of the adult show plainly their threefold origin, the bones in question being short and separated by deep grooves. The

1 The spelling and capitalization in this article accord with the request of the author.

other character distinguishing the Penguins from all other birds is the degenerate condition of the wings, which are reduced to flattened inflexible paddles or flippers without any wing quills.

Penguins are confined to the southern and Antarctic seas. In the far south they form the most characteristic feature of those inhospitable regions. In addition to the shores of the Antarctic Continent and the various Islands of the South Seas they are found around the coasts of New Zealand, Australia, South Africa and South America. The most northerly point at which Penguins have been hitherto met with are the Galapagos Islands off the coast of Equador on the Equator in the Pacific.

On the coasts of South Africa only one species is met with. This is the Black-footed or Jackass Penguin (*Spheniscus demersus*) which makes up in numbers for the lack of variety. It is found everywhere along the coasts from the southern



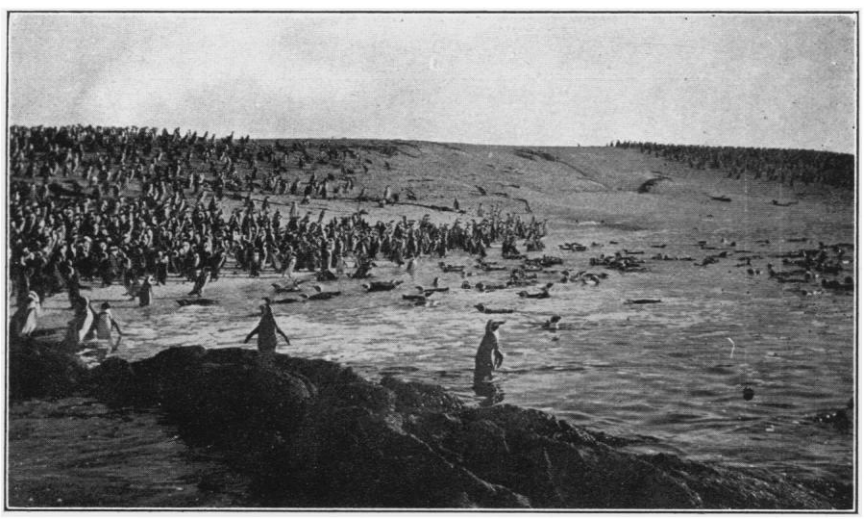
BLACK-FOOTED PENGUINS ON DASSEN ISLAND, SOUTH AFRICA

part of Angola on the west as far as Port Elizabeth on the south, and can be seen at any time swimming about in the sea quite unconcerned, even in the harbour at Cape Town. These Penguins never voluntarily come ashore on the mainland but resort to certain small islands all along the coast for breeding purposes. Here they are to be seen in enormous numbers at certain times of the year and it is the purpose of this article to describe a visit to one of these islands made in order to observe these and other sea birds.

The particular island which I last visited is called Dassen Island and lies about forty miles north of Cape Town and four or five miles from the nearest point of the mainland. It is low and sandy, about two miles long by about a mile across. My wife, to whom I am indebted for the photographs used to illustrate this article, and I, left Cape Town on February the third last year in a Government tug, in company

with Mr. Meade-Waldo and Mr. M. J. Nicoll, two ornithologists who were at the time making a cruise with the Earl of Crawford in his steam yacht Valhalla round Africa. We reached Dassen Island late in the afternoon. We stayed the night at the lighthouse keeper's cottage and spent the next day watching the birds. The Penguins covered the whole island and although it was very late in the season a great many were still breeding. As a rule shallow short burrows are dug out in the sand and the feet are used to throw out the debris. It was a curious sight to see a regular fountain of sand flying up in the air when this operation was proceeding. Where the ground is rocky a crevice or a sheltered spot under a rock is used for nesting purposes, but so numerous are the birds on Dassen Island that the whole ground is riddled with nesting holes and it is difficult to avoid falling into them when walking about. A few small pieces of rag or seaweed or other rubbish are sometimes made use of in the construction of the nest itself but it is never a very elaborate structure.

The eggs are usually two in number, though sometimes one, sometimes even three



BLACK-FOOTED PENGUINS ON THE SHORES OF DASSEN ISLAND, SOUTH AFRICA

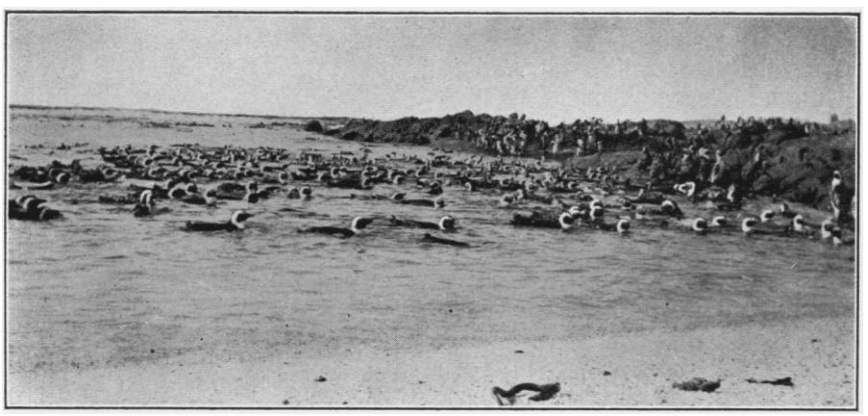
are to be found; they are chalky in texture and in colour plain white with a faint tinge of bluish; but before being hatched are a good deal stained and soiled with dirt. The nestlings are comical looking youngsters covered with a uniform coat of brown down; this gradually peels off in shreds and the plumage of the young bird appears beneath. At this stage there is no trace of the white bands at the sides of the head or of the black horseshoe-shaped band across the chest; these are probably not acquired until after the first moult a year later. We observed a great number of young birds lying dead about the island; this is probably due to some accident having happened to the parents while away on a fishing excursion, as the young birds are entirely dependent on their parents for their food.

In the early morning numbers of birds were seen marching solemnly in long processions down towards the shore to take their morning bath and to go fishing; when hustled at all they fall flat on their bellies, wriggle along at a somewhat faster pace with the help of their flippers, till at last reaching the rocks along the shore they plunge into the sea with obvious satisfaction. As can be seen in the photo-

graphs they sit very low in the water when swimming and at the slightest alarm pop down below the surface very quietly and without any splash or jump, forming in this respect a marked contrast to the Duikers or Cormorants which are also very numerous on the island.

The food of the Penguin consists entirely of fish caught by diving and of these they must consume enormous quantities; when captured they are invariably very fat with a very thick layer of blubber underlying the skin and on this they can live many weeks without feeding.

The breeding season of the main body of the Penguins is in May and June (midwinter in South Africa), though eggs and young at all stages can be found the whole year round so that the time of our visit was not very favourable for seeing the island really covered with birds. Between May and August the eggs are collected and shipped to Cape Town for sale and the birds are not allowed to sit until the beginning of September. These islands and the other Bird islands round the coast of Cape Colony belong to the Government and are each placed under the charge of a headman. During the egg season a number of additional men, hired for the purpose by the headman, march across the island in different directions each



FLOCK OF PENGUINS ABOUT TO LAND ON THEIR NESTING ISLAND

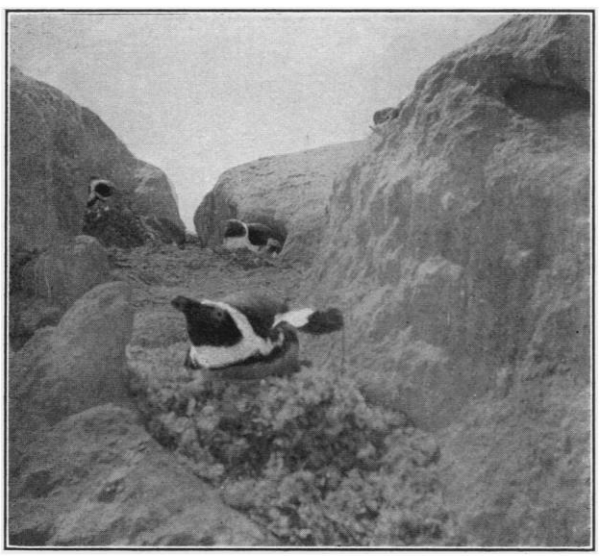
one provided with a basket and a kitchen ladle tied onto the end of a long stick. This is used for scooping the eggs out of the burrows from underneath the birds. From Dassen Island an average number of about three hundred thousand (300,000) are gathered in this way each season and as this does not include incubated and broken eggs the number taken altogether cannot be much less than half a million. According to the Official Government returns the total number gathered from all the islands in 1902 was 469,400 valued at $8405, while in 1901 the number was 630,000 valued at $9,845.

The eggs are sold in Cape Town and other large centres and are eaten chiefly by the coloured population. Though a little fishy they are quite pleasant to the taste, the albumen being slightly bluish and transparent like that of a Plover's egg when boiled.

Of the other birds on the island by far the most numerous are the "Trek Duikers" (i. e., Wandering Divers), a species of Cormorant (*Phalacrocorax capensis*). This bird is one of the group of Cormorants with fourteen tail feathers and has a completely black plumage with a patch of yellow naked skin at the base

of the bill and a green iris. Like the Penguin the Cormorant is important commercially as from it is yearly derived large quantities of guano which together with the Penguin's eggs yields a considerable revenue to the Cape Government. The guano is scooped up from the rocks on which the Duikers sit and also from the nests and surrounding ground after the breeding season is over. The breeding season for the Duikers is from December to July, though as in the case of the Penguins a few can be found nesting at other times of the year. The nests are placed as a rule on the ground and built up of sticks and twigs of the low plants and grasses which grow on the islands. There is little or no lining. The eggs, usually four in number, are of the Cormorant type, oval and pale blue with a chalky white covering. They measure about 2.15x1.35 inches.

From this bird and from the Malagas (*Sula capensis*), which however does not usually resort to the same islands as the Duiker, from 4000 to 5000 tons of



BLACK-FOOTED PENGUINS ON NESTS IN A CLEFT OF THE ROCKS

guano are obtained every year by the Cape Government and sold to the farmers at about $30.00 a ton, approximately the cost price.

I visited one of the breeding places of the Malagas in September, 1903. The Island itself is called Malagas Island, and is situated at the entrance to the harbour of Saldanha Bay, some seventy miles north of Cape Town. The island is quite a small one, only about half a mile across and is surrounded by low rocks and cliffs from ten to twenty feet in height so that landing was by no means easy.

I found the island, which was fairly flat, literally carpeted by the birds sitting so close to one another as to be in many cases actually touching each other. Here the nests consist of nothing but little mounds of mud and guano with a slight depression at the top, while everywhere between the nests the ground was bare and white with a deposit of excrement. Only one egg is laid, and on this the bird sits very closely, covering it with its large webbed feet so that it becomes very dirty long before incubation is completed.

The following is a list of the bird islands of Cape Colony, together with those of the coast of German Southwest Africa which also belong to the Government of Cape Colony; this is followed by the yield of guano and Penguins' eggs for 1902 the last year of which I have a complete record.

I. ISLANDS ON THE COAST OF CAPE COLONY

	Tons of guano collected in 1902.	Number of Penguin eggs gathered in 1902.	Chief guano-producing birds.
Bird Island in Algoa Bay	197	....	Malagas.
Dyer's Isle, nr. Danger Point in Caledon Division	253½	26,400	[Penguins. Trek-Duikers and
Seal Island in False Bay	....	....	....
Duiker Klip, nr. Hout Bay in Cape Division	3	....	Trek-Duikers.
Dassen Island, 60 miles north of Table Bay	240¼	325,000	[Penguins. Trek-Duikers and
Foundling's Island, south of Saldanha Bay	93	....	Trek-Duikers.
Jutten Island, Saldanha Bay	378¼	98,000	" "
Marcus Isle, Saldanha Bay	88¼	20,000	" "
Malagas Island, Saldanha Bay	688½	....	Malagas.
Paternoster Isle, north of Saldanha Bay	69¾	....	Trek-Duikers.
Islands in Lambert's Bay, Clanwilliam Division	321¼	....	" "
Elephant's Rock, off Olifant's River, Van Rhyn's Dorp Division	25	....	" "
			" "
Total	2357	469,400	

II. ISLANDS ON THE COAST OF GERMAN SOUTH-WEST AFRICA

FROM THE NORTH SOUTHWARDS

	Tons of guano collected in 1902.	Chief guano-producing birds.
Hollam's Bird Isle	50	Trek-Duikers.
Mercury Isle	120	" "
Ichaboe	1300	Trek-Duikers and Malagas.
Possession Island	600	" " " "
Sinclair's and Plum-pudding Islands	120	Trek-Duikers.
Halifax Island	160	" "
Pomona Island	80	" "
Penguin Seal Isle	15	" "
	2445	
Add Colonial Islands	2357	
Total no. of tons of guano collected during 1902 for the Cape Gov't	4802	

Colorado Springs, Colorado.